Ground-mounted photovoltaic power plants in Alpine winter sports destinations: Guest, resident and non-visitor preferences

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How are ground-mounted PV systems perceived in alpine winter sports destinations? Our results show that in order for the energetic development of a destination to be well-balanced, various project attributes need to be evaluated. These attributes include factors such as how the landscape will be affected, if the project will use 100% renewable energy, whether a comprehensive climate action programme will be implemented and if a local stakeholder will operate the solar power plants. We identified five interest groups that differ significantly in terms of their preferences for how to develop ground-mounted PV plants: Residents, non-visitors and three contrasting groups of visitors.

Introduction

PV panels in the Swiss Alps achieve 1.5 to 2 times higher annual yields than elsewhere and a winter electricity share of up to 56%. Due to this potential, ground-mounted PV systems in Alpine areas will be able to meet a large proportion of the increased renewable energy demand in future, especially during the winter season. However, renewable energy systems can impact the aesthetics of a landscape and therefore face challenges in terms of social acceptance.

Method

In this study, we conducted an online discrete choice experiment, surveying a representative panel of 1,228 German-speaking Swiss to measure their preferences for hypothetical renewable energy production scenarios using ground-mounted PV systems near ski slopes in a winter sports destination.

A discrete choice experiment is a quantitative method used to elicit preferences from participants without directly asking them to state their preferred options. Participants were presented with a series of alternative hypothetical scenarios, each of which consisted of a combination of varying attributes (attribute-levels).

A sample scenario from the present study is illustrated in Figure 1. In total, participants were presented with six of these scenarios.

		Scenario A	Scenario B
			
Info on the solar systems in the picture	Advocacy organizations	• Mixed opinions in all bodies	• Municipal council • Second homes association • Business & Tourism • Nature conservation organizations
	Operator	• Local power company	• Region's lift operator
Climate protection measures		• Winter sports destination does not publish any information on climate	• 100% regional renewable energy • Comprehensive environmental program

I choose ○ Scenario A ○ Scenario B ○ None of the above scenarios

Figure 1: Example of a set of choices in the discrete choice experiment.

How did the attributes contribute to the survey respondents' choice of scenario?

The "**climate protection measures**" attribute (the extent to which the winter sports destination is committed to climate protection) had the greatest effect on respondents' decision to choose a particular scenario. The majority preferred scenarios with 100% regional renewable energy and a comprehensive environmental programme.

The „**opinion leaders**" attribute (organisations advocating for ground-mounted PV systems in the destination) and "**area**" attribute (area occupied by ground-mounted PV panels) influenced the decision to choose a particular scenario equally, while the **panellists disagreed most on the "area" and "climate protection measures" attributes**.

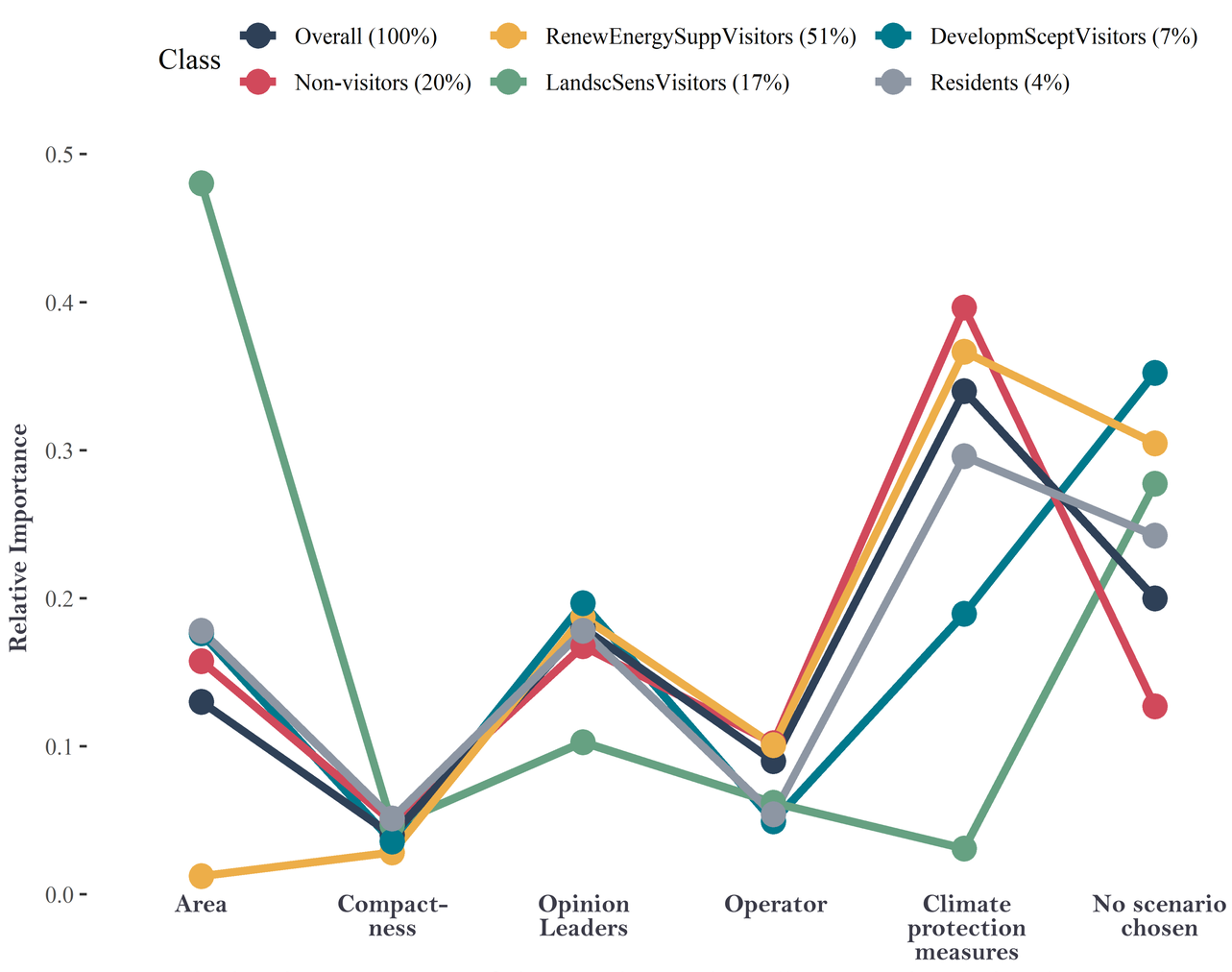

Figure 2: Relative importance of the evaluated attributes. Class size (%) in relation to the overall sample.

The panellists agreed on the „**operator**" attribute (who would profit financially from these PV systems, bear the risks and feed the renewable energy into the power grid?). Furthermore, the majority preferred scenarios where **a regional player, such as the local power company or the region's lift operator, would be in charge of operating the PV systems.**

There were no significant differences revealed in the effect of the "**compactness**" attribute (how densely the panels would be arranged).

Interest groups differed significantly in their preferences for the development of ground-mounted PV in winter sports destinations

Figure 2 presents the relative importance of the attributes in the choice model for each interest group.

Renewable energy supporting visitors based their decisions on climate protection measures. They represented the largest group in our panel and mostly preferred scenarios with 100% regional renewable energy. The proportion of women was higher in this group than in the landscape sensitive visitors group.

Landscape sensitive visitors based their decisions on the appearance of the landscape, preferring landscapes with fewer ground-mounted PV installations.

Development sceptical visitors tended not to select scenarios at all. This group represents the smallest visitor group, but visits winter sports destinations most often.

Residents live in winter sports destinations. The most decisive factor for them was climate protection measures, however, they also tended to assess landscape impact more critically than renewable energy supporting visitors.

Non-visitors almost never go to winter sports destinations in winter and differ significantly from the other groups in terms of age, income, and educational level. The most decisive factor for them was climate protection measures.

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